areawide water quality: the 208 planning experience

Of the many changes brought about by passage of the amendments to the Water Pollution Control Act of 1972 (Public Law 92-500), the one having the greatest potential impact on urban planning is Section 208. This Section calls for areawide water quality management in all regions exhibiting complex water quality problems caused by urban and industrial concentrations. Provisions of Section 208 afford opportunities to achieve economies of scale and consistency of management plans among the several political jurisdictions in metropolitan areas; they broaden the scope of water pollution control to embrace urban storm water runoff and nonpoint sources of pollution from agriculture, forestry, construction, and other activities; and they significantly expand the range of management techniques to include regulatory programs at the areawide level and, if necessary, land use controls.

The purpose of this paper is to describe the basin-level planning environment within which areawide planning takes place, the current status of the program, and the planning process as it was developed for the Research Triangle of North Carolina, the first area in the United States designated and funded under the present legislation.

the basin planning environment

Areawide planning as recorded in Section 208 is but one of three scales in the comprehensive water quality planning strategy set forth in PL 92-500. Planning at the largest scale is conducted on a river basin level. This planning process, conducted by the states, consists of developing water quality management plans for each river basin and its major sub-basins as prescribed in Section 303(c). These basin plans have two purposes: (1) to determine appropriate levels and schedules for construction of water treatment facilities for all municipal and industrial sources where water quality standards can be satisfied in a relatively simple manner, and (2) to determine those stream segments and sources of pollution where the standards cannot be satisfied in a cost-effective manner by the simple application of treatment technologies to individual dischargers. It is in the latter areas that either the states or local governments, acting through a regional organization, must initiate planning at the second level — areawide planning as defined by Section 208. When the latter plans have been developed and adopted by the local, state, and federal governments, they become part of the basin plan.

The third level of this process, waste treatment facilities planning, consists of detailed engineering surveys, analyses, and design of publicly-owned waste treatment facilities. These facilities are the structural components of either basin or areawide plans, and are eligible for 75 percent federal construction grants provided in Section 201 of the legislation.

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In addition to the above three-level strategy, Congress recognizes the need to integrate this single-purpose water quality process with the broader water resource concerns of the U.S. Water Resources Council, the agency charged with implementing the Water Resources Planning Act of 1965 (PL 89-90). In Section 209 of PL 92-500, Congress directed the Council to assign priority to the development of comprehensive water resource plans in those basins where areawide quality management was found to be necessary.

Although the three-level water quality and related water resource planning strategy implies an orderly sequence from the broadest level down to facilities planning, the actual environment within which areawide planning operates is complicated by difficulties of scheduling

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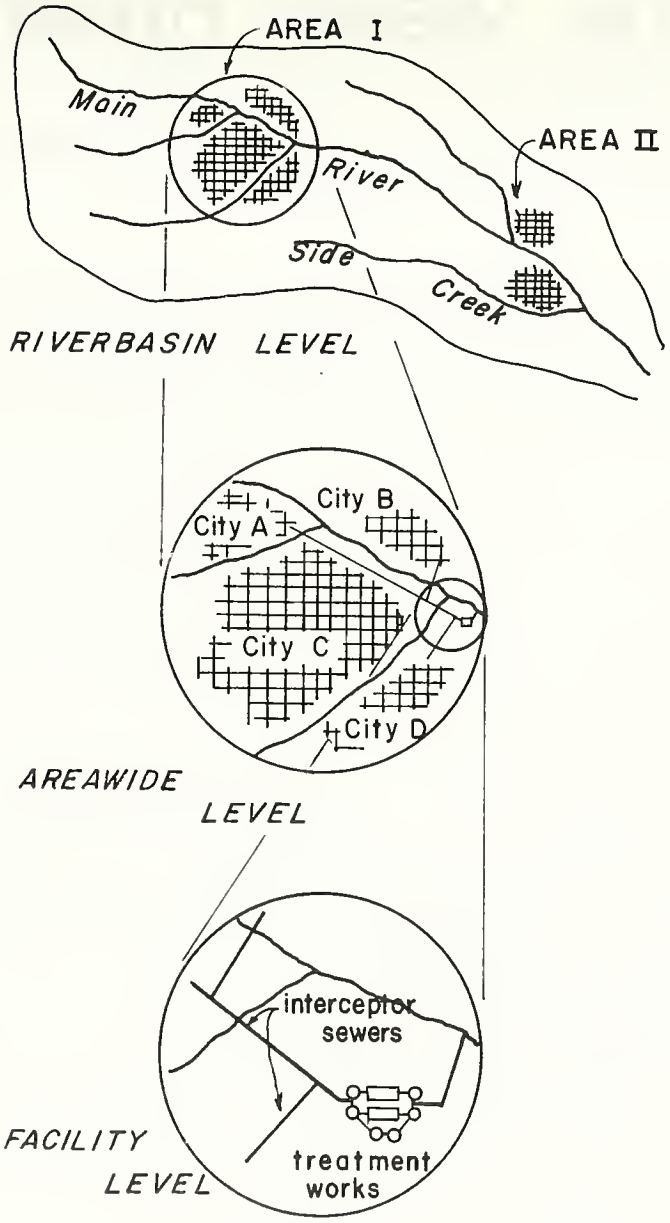

THE LEVELS OF WATER QUALITY PLANS

Figure by David Moreau

and funding of those interrelated activities. In many cases, construction of major water quality management facilities was begun prior to the initiation of areawide planning. Another problem is that basin-level water quality plans in many areas are being developed simultaneously with 208 plans; and, in most instances, comprehensive water resource plans will follow, not lead, development of areawide water quality plans. The existence of any of these difficulties necessitates adaptation of the 208 planning process to local conditions, either by foreclosing some of options or by expanding the range of alternatives to cover uncertainties about major water quality related developments.

status

As of July 1, 1975, 149 areas in the U.S. had been designated for areawide planning and $163 million had been granted in support of the 208 program. If it had not been for delays by the Environmental Protection Agency (EPA) in implementing Section 208 and ambiguities about its applicability and level of detail in areas not explicitly designated for such planning, more areas might have been designated and funded. However, a recent court decision has made it clear that detailed plans, prepared either by designated areawide planning agencies or by the state, will be required for *all* regions exhibiting complex water quality problems. Under regulations soon to be published by EPA, state planning agencies will be given a stronger role in the 208 program, and will be eligible to receive grants to carry out these activities.

scope

The functional scope for areawide planning has not been tightly defined by EPA. A considerable amount of judgment must be exercised in setting an agenda for each of the regions in which it is initiated. Minimum requirements specified in the Act include: (a) the formulation of plans for the collection, treatment, and disposal of municipal and industrial wastes and urban stormwater runoff; (b) the estimation of pollution from agriculture, silviculture, mining, construction, and saltwater intrusion, and the formulation of control techniques to manage such pollution, including land use controls if necessary; (c) development of a regulatory program; and (d) formulation of a management system consisting of one or more agencies to implement the plan. Regulatory programs are to be granted powers to implement effluent limitations, regulate the location and modification of waste dischargers, and assure that industrial and commercial contributors to public facilities meet applicable pretreatment standards.

Beyond these formal minimum requirements, the scope is flexible within the limits of available planning resources. Common sense dictates that all significant interactions among water quality, other water resource, and land use projects and programs be made explicit. Eighty-eight of the designated 208 areas include counties that have also been designated as Air Quality Maintenance Areas under the federal air quality manage-

ment program. Because these activities, along with land use and transportation planning, involve many common data bases, analytical models, and multiple-purpose control measures, the sharing of resources and development of cohesive strategies among these programs should be mandatory.

the planning process and work at triangle j

A multiple objective planning process, emphasizing environmental quality and economic efficiency, is required of 208 planning in both the legislation and in guidelines prepared by EPA. Under the environmental quality objective, the principal criterion is satisfaction of applicable water quality standards. In addition, all proposed actions are to be evaluated with respect to those environmental impacts identified in regulations developed by the Council on Environmental Quality pursuant to the National Environmental Policy Act. Economic efficiency contributions are measured by direct resource costs of proposed facilities (capital, operation, and maintenance), land, and administrative costs of operating facilities, monitoring, and inspection. In addition, alternatives are to be evaluated with respect to their financial feasibility, relationships to other public projects, public health, and gross impacts on economic activity and employment. Public participation is required at the minimum level of public hearings and an advisory committee consisting of local elected officials and representatives of administrative agencies of state and federal agencies. More substantial public input is encouraged through aggressive one-way and two-way interactions among the planning staff, units of local government, organized interest groups, and the public at large.

In the Research Triangle particular emphasis is being placed on surveys of nonpoint sources of pollution, land use, and environmental resources — those elements for which existing data sets are most incomplete.

Details of how the process is organized, data gathered, and analytical techniques employed in support of the process will vary widely among the areas. As part of the first 208 grant, a pilot study was undertaken by this author[1] and his colleagues to develop an operational program of work for the Triangle J Council of Governments, the designated agency for areawide planning in the Research Triangle of North Carolina. That program, shown schematically in Figure 1, consists of four basic steps: (1) assessment of existing conditions; (2) formulation of water quality related areawide goals; (3) development of criteria for guiding the formulation and evaluation of alternatives; and (4) a two-stage process for generating and evaluating the alternatives.

Assessments of existing conditions involved surveys and analyses of (a) natural resource and environmental systems; (b) water-quality related activities, their land and water resource demands, rates of waste generation, and environmental impacts; and (c) water quality and related management systems — their legal, organizational, policy, and financial attributes. In the Research Triangle particular emphasis is being placed on surveys of nonpoint sources of pollution, land use, and environmental resources — those elements for which existing data sets are most incomplete. Nonpoint loads are being estimated through the use of automatically activated samplers, continuous flow recorders, and rainfall gauges located along streams in the study area. Impacts of these loads during and following rain storms are being measured by continuous instream monitors. Inventories of land use and environmental resources are being constructed with the aid of Earth Resources Satellite data aerial photographs, and local land use maps.

Assumptions as to location and intensity of economic activities and land uses are being developed through construction and evaluation of alternative scenarios of these activities. Outputs of this process will include: (1) estimates of the range of total waste loads and their spatial distributions that may be anticipated within the area over the planning horizon; and (2) identification of the levels to which development may

Urbanization creates unsightly and potentially dangerous pollution.

Courtesy of EPA/WRRI-UNC

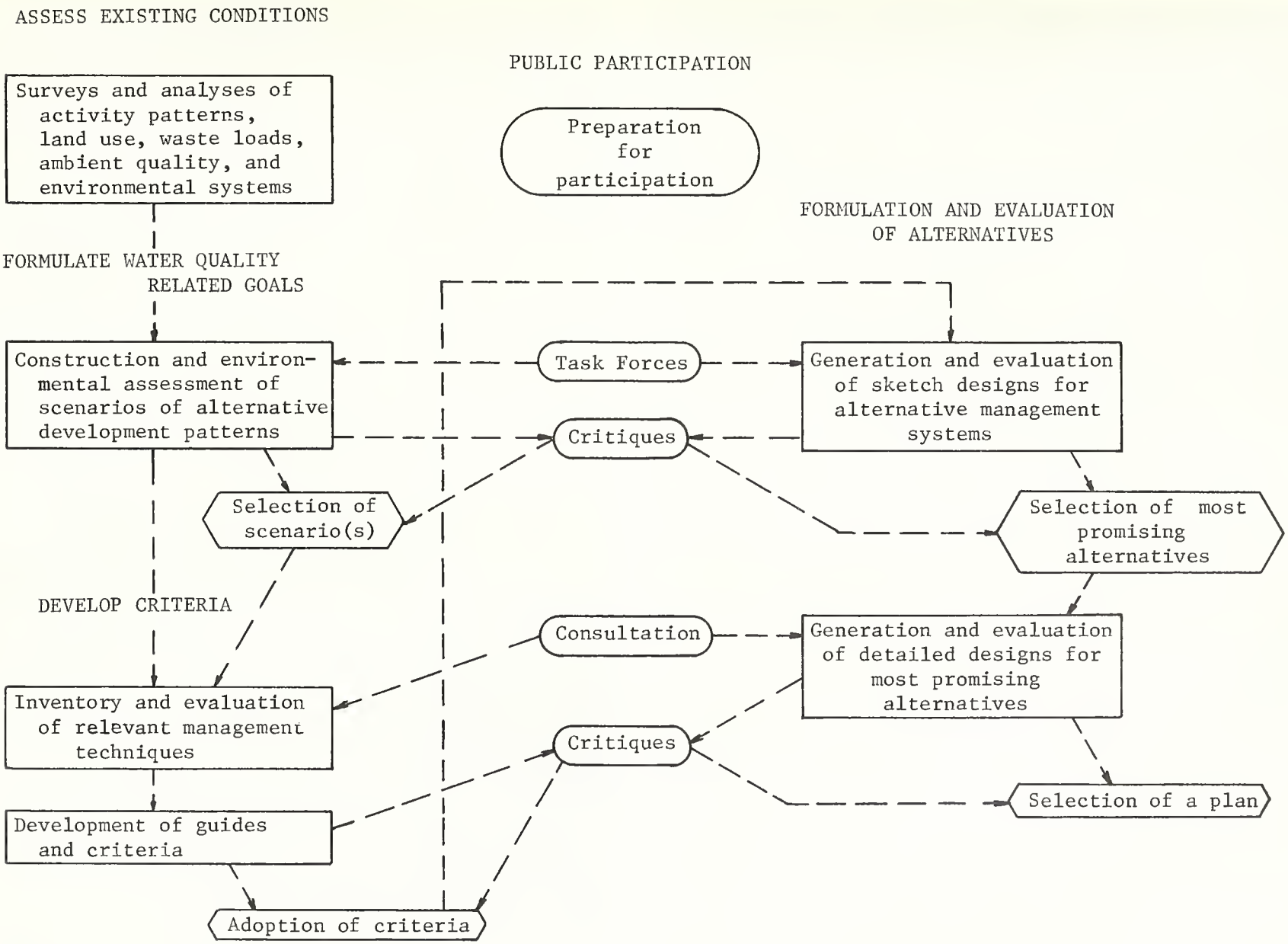

FIGURE 1. DIAGRAM OF THE PLANNING PROCESS

occur in subareas without exceeding economic, technical, and environmentally sound limits. The scenarios are being constructed by developing areawide aggregates of population and related economic activities to reflect different mixes of employment opportunities, resource consumption levels, and rates of waste generation. These aggregates are then allocated over space using a simplified land use model. In the allocation process, locations of basic employment are determined exogenously; households are then allocated according to their proximity to employment and centers of residential development.

Alternative management strategies are to be developed with variations in three basic factors: (1) the level of centralization in policy-making and administrative systems; (2) the degree of reliance on non-treatment techniques such as recycling, land use, and pricing policies; and (3) structural systems for the collection, treatment, and disposal of wastes. An exhaustive examination of all alternatives that could be generated by selecting many levels for each of these factors would exceed available planning resources and yield excessive amounts of information. Therefore, a two-stage process to search for alternatives has been adopted. In the first stage, six or more strategies, representing three levels of centralization, two levels of reliance on non-treatment techniques, and one or more structural designs for each of the other combinations, will be developed and evaluated at a coarse level of detail. Levels of centralization will be: (1) a local alternative emphasizing individual community and industry responses; (2) clustering of dischargers about two or three centers of activity within the area; and (3) a strongly unified regional approach. Reliance on non-treatment techniques will be set at two levels, the existing level involving minimum compliance with applicable requirements, and a higher level probably including effluent density zoning, waste load allocation to sub-areas, aggressive programs to reduce waste loads, and a strong emphasis on recycling and reuse. Only the most promising of these alternatives or modifications to them, as indicated by the feedback from public participants, will be elaborated in the second stage.

Monitoring the waterways is an essential part of the study.

Courtesy of EPA/WRRI-UNC

In the present study, environmental consequences of proposed actions will be measured by the amount of resources lost or severely disrupted by proposed actions (or inaction).

Finally, evaluations of alternatives are to be made with respect to the objectives listed previously. There should be little difficulty in assessing direct economic efficiency costs. There are well-known difficulties in assessing economic efficiency benefits, but the Water Resources Council Standards[2] provide well developed guidelines for this task. Methods for assessing beneficial and adverse contributions of alternatives to the environmental quality objective are less well developed. Measures of whether water quality standards will be satisfied involve relatively straightforward water quality models, although there will no doubt be substantial questions as to the predictability of any model. Measurements of other environmental impacts will have to rely on the imperfections in the current state-of-the-art in preparing the statements required by the National Environmental Policy Act. Ortolano and Hill[3] and Hufschmidt[4] found that the more recent statements have shown improvements over those written shortly after the Act was passed in 1969, but there remains no systematic and generally accepted principal for measuring and displaying environmental impacts. In the present study, environmental consequences of proposed actions will be measured by the amount of resources lost or severely disrupted by proposed actions (or inaction). Summary statements will illustrate the uniqueness and relative scarcity of affected resources, as well as the timing, duration, and degree of permanence of environmental impacts.

Impacts on the general economy, employment, and health of the area will be assessed as particular issues arise in the formulation of management strategies. Impacts will also be assessed based on social equity considerations. Evaluation of the compatibility of the plan with other proposed water projects in the area will focus on the issue of eutrophication in two major multiple purpose reservoirs in the region.

comments

Expectations of the consequences of areawide planning in early rounds of activity under PL 92-500 must be tempered by several factors: (1) existing organizational arrangements for water quality management; (2) the inexperience of planners with nonpoint sources; (3) a reluctance of government at all levels to impose effective land use controls; (4) development of relationships between areawide and state-level water quality management; and (5) relationships between water quality and water resource management. Existing agencies for areawide planning consist predominantly of councils of governments and regional planning commissions with very limited powers of implementation and little experience in water quality planning. Only a few of the 149 designated agencies are water quality management agencies or governments of general jurisdiction. The capacity of non-water agencies to develop and foster the implementation of operational water plans remains uncertain. The search for cost-effective control measures for nonpoint sources is very much in its infancy. Further, the legal and political processes for establishing effective organizational arrangements among local, regional, and state governments for water quality and the broader aspects of water resource management must still be evolved.

Footnotes

[1]Moreau, D. H. *Field-Level Planning for Areawide Waste Treatment Management.* Research Monograph No. 21. Chapel Hill: Center for Urban and Regional Studies, University of North Carolina, 1975.

[2]U.S. Water Resources Council. "Water and Related Land Resources: Establishment of Principles and Standards for Planning," *Federal Register*, September 10, 1973, pp. 24775-869.

[3]Ortolano, L., and Hill, W. W. *An Analysis of Environmental Statements for Corps of Engineers Water Projects.* Institute for Water Resources, Report 72-3. Springfield, Va.: National Technical Information Service, 1972.

[4]Hufschmidt, M. M. *Environmental Statements and Water Resources Planning in North Carolina.* Report No. 94. Raleigh: Water Resources Research Institute of the University of North Carolina, 197